SEG3904 Project Proposal

Project Title:

AI Chess Bot

Vivek Bhandari, 300247090 – vbhan095@uottawa.ca

Prof. Stéphane Some – Stéphane.Some@uottawa.ca

Overview

The purpose of this project is to develop an AI chess bot that can play chess against human opponents. The project will start with understanding the basics of chess and simple AI techniques, gradually advancing to more complex algorithms and optimizations. This chess bot will be implemented using Python, leveraging basic AI algorithms like Minimax and Alpha-Beta Pruning. By the end of this project, a solid understanding of chess rules, Python programming, and fundamental AI concepts will be attained.

Learning Outcomes:

At the end of this project, the student will have learned to:

- **G1**: Program in Python, a language often used for AI and machine learning projects.
- **G2**: Analyze and optimize algorithms to improve their efficiency, reliability, and maintainability.
- **G3**: Apply design patterns and algorithms suitable for game AI.
- **G4**: Design and use data structures for efficient game state representation and move generation.
- **G5**: Use version control, issue tracking, and automated testing tools (e.g., GitHub).
- **G6**: Work individually on software engineering activities.

Technologies:

- **Python**: A versatile programming language popular for AI projects.
- **Pygame**: A library for creating graphical interfaces in Python.

- **Numpy**: A library for numerical computations in Python.
- **python-chess**: A chess library for move generation, validation, and board representation.
- **GitHub**: For version control and project management.

Resources:

- I. Khokhani, J. Nathani, P. Dhawane, S. Madhani and K. Saxena, "Unveling Chess Algorithms Using Reinforcement Learning and Traditional Chess Approaches in AI," 2023 3rd Asian Conference on Innovation in Technology (ASIANCON), Ravet IN, India, 2023, pp. 1-4, doi: 10.1109/ASIANCON58793.2023.10269900. keywords: {Training;Technological innovation;Q-learning;Training data;Knowledge representation;Games;Chatbots;Alpha Zero;Stockfish 8;Q-Learning;Chess bots;Artificial Intelligence;Reinforcement Learning},
- Russell, Stuart J. (Stuart Jonathan), et al. Artificial Intelligence : A Modern Approach. Fourth Edition., Pearson, 2021.
- **Online tutorials and courses on Python and AI** (Coursera, Udacity, edX)

Deliverables

Deliverable	Weight
Initial project description and requirements	15%
Simple command-line chess interface	10%
Basic Minimax algorithm implementation	15%
Alpha-Beta pruning enhancement	15%
Graphical user interface using Pygame	15%
Proper use of version control and issue tracking tools	10%
Final report with requirements, architecture, challenges, resolutions, code structure overview, self-assessment of learning, and future work items	20%

Work Plan (135 hours)

Week	Met?	Action	Hours
1		Project plan, expectations, and technologies. Environment setup.	10
2		Understanding chess rules and basic Python syntax.	15

3		Implementing a simple command-line chess interface.	10
4		Introduction to Minimax algorithm and initial implementation.	15
5		Enhancing Minimax with Alpha-Beta Pruning.	15
6		Testing and debugging the Minimax implementation.	15
7		Creating a basic graphical interface using Pygame.	15
8		Adding features to the graphical interface.	15
9		Integration of AI and GUI, final testing.	10
10		Report drafting and software inspection.	10
11		Final report and software delivery.	5